

TEACHER KNOWLEDGE FOR TEACHING MATHEMATICAL PROBLEM SOLVING

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The importance of problem solving (PS) in mathematics education is well established regarding its central role in teaching and learning mathematics for deep understanding. With a PS habit-of-mind, students are also prepared for real problems and to thrive in today's world. To support students' learning of PS, teachers should hold appropriate knowledge for teaching PS from the perspective of PS as involving a problematic situation, a way of thinking, and a cyclic process (e.g., Polya, 1954). This presentation is based on the initial stage of a study that considers this knowledge in terms of PS research in the 21st century. This stage involved a survey of PME research reports (RR) on PS for 2000 to 2021. PME RR provide a snapshot of the international landscape of research on PS in the 21st century that could offer initial insights of this knowledge relevant to the field. The survey explored the types of knowledge the RR addressed in relation to teaching and learning PS and the relationship to mathematical PS knowledge for teaching (MPSKT). Chapman (2015) framework for MPSKT provided the theoretical baseline to frame the study. It consists of seven types or areas of knowledge teachers should hold to engage students in PS effectively and meaningfully.

The survey process included identification of relevant studies based on a systematic examination of PME RR titles and abstracts using keywords related to MPSKT (e.g., PS, problem posing, problems, modelling, beliefs, and metacognition) and exclusion of studies not focused on genuine PS and K-12 students or teachers. The final set of studies were examined to identify common themes. The findings consisted of eight themes for studies on learners and six themes for studies on teachers related to MPSKT. The themes for learners consisted of: instructional strategies, PS process, technology, assessment, problem posing, collaboration, metacognition, and emotion. They suggest teacher knowledge needed to understand students as problem solvers and ways to support and evaluate their learning of PS. The themes for teacher consisted of: problem posing, PS knowledge development, knowledge for teaching PS, beliefs, technology, and collaboration. While the findings aligned with Chapman's (2015) model of MPSKT, more importantly, they suggested ways to make visible subcategories of components of the model (e.g., collaboration, emotion) to provide a more comprehensive landscape of MPSKT that could be used to inform teacher education and research.

References

- Chapman, O. (2015). Mathematics teachers' knowledge for teaching problem solving. *LUMAT*, 3(1), 19-36.
- Polya, G. (1954). *How to solve it*. Anchor Books.